



Decision Support Model for Online Education of Logistics Management Major from the Perspective of “Credit Bank”

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Abstract. For the logistics management major from the perspective of “credit bank”, the traditional online education decision support model has poor reliability due to the lack of data analysis and processing ability. Therefore, this paper proposes a decision support model for online education of logistics management major from the perspective of “credit bank”. Based on the actual needs of online education of logistics management, the basic framework of the model is built; the relevant database required by the model is designed, and the data is classified and standardized before data storage; the designed data path is taken as the support of the model, and the credit settlement in the credit bank is taken as the ultimate goal, and the objective function and related constraints of the model are designed, so as to realize the logistics management Decision support for online education of management major. The experimental results show that the model is more reliable than the traditional decision support model because of its low parameter correlation and high data integrity.

Keywords: Credit bank · Logistics management · Online education · Decision support

1 Introduction

The rapid development of computer, network and communication technology has laid the foundation for online education, and domestic online education is advancing towards popularization and internationalization. Various problems of online education have also been debated, and the most important one is the quality assurance of online education [1]. Online education is essentially different from traditional education. It is mainly based on media teaching, separated from teaching and learning. It is an open learning, emphasizing students' autonomy and individual learning. Quality assurance is a common problem of all kinds of education and an eternal theme [2]. Due to the essential difference between online education and traditional education, the support system for traditional education is no longer applicable. This is an urgent need to establish an effective quality assurance

support system for online education, so as to ensure the vitality of online education and play its due role in education for all [3].

Especially for the logistics management major, logistics is a major that keeps pace with the times and is changing with the construction of information technology. With the help of information technology, the construction of online education decision support model and the implementation of online education and learning is an important part of the current online education quality assurance system [4]. In the process of decision support, a large number of data and materials are needed to be processed, and these data and materials are analyzed and judged, and finally decision-making is made, which will consume a lot of time and energy. Therefore, an effective information means is needed to achieve efficient and accurate decision-making.

The traditional university system has a distinct shadow of planned economy. The development of the university is completely led by the government. The university has no autonomy, and everything is subject to the management of the government. In the administration of colleges and universities, there is a serious “government” style, and the administration is serious. Modern society is a market economy system, and colleges and universities have the right to run their own schools. Society and the market have increasingly strong expectations and demands for colleges and universities [5]. It is of great significance to build a management system that meets the needs of modern social development and conforms to the law of university development. The urgency of social demand for talents and education researchers deeply feel that only by taking the modern university system which is most in line with its own development law and education reality, can universities be more competitive [6].

“Credit bank” system can provide system guarantee for the individualization of educational goal and process. The original intention and characteristics of the credit bank system determine that it is the institutional guarantee of personalized education service [7]. The purpose of “credit bank” is to provide learning services for all kinds of learners. There are many types of students, which can only be unified on the basis of ensuring their personality. The system is very inclusive for all kinds of learners. The “credit bank” system includes a flexible educational system that can be shortened and extended by choosing courses independently according to their own time, place and preferences. The achievement and progress of learners are measured by credits [8]. It provides the most inclusive system for students to plan and manage their own learning process and activities. This has a positive effect on enhancing learners’ creativity in learning activities.

The research of decision support theory and technology has been quite mature at home and abroad, and has been widely used in various fields. This paper aims to provide an effective decision support model for online education of logistics management major from the perspective of “credit bank”, and solve some problems existing in the traditional decision support model, so as to assist logistics management major to achieve better online education. The specific research ideas are as follows:

First, the paper analyzes the actual needs of online education for logistics management students and constructs the basic framework of decision support model;

Secondly, the relevant database is designed to classify and standardize the data before data storage;

Then, taking the credit settlement in the credit bank as the final goal, the model objective function and related constraints are designed, so as to realize the decision support for online education of logistics management specialty;

Finally, summarize the full text.

2 Design of Online Education Decision Support Model for Logistics Management Major from the Perspective of “Credit Bank”

2.1 Model Architecture Design

The three component structure of DSS includes dialogue component, data component and model component, as shown in Fig. 1.

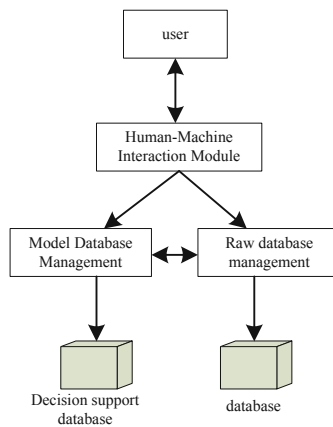


Fig. 1. Infrastructure of decision support model

The human-computer interaction part is also the interface of input and output, which is the interface component of the model. Receive the information input by the user, and output the processing results, to provide users with rich and colorful display and dialogue forms, such as graphics, images, sound and so on [9]. The model base is used to store models, which are expressed in the form of a computer program and can be run in a certain way for input, output, calculation and other processing; the model base management system should call out the existing basic models in the system according to the problems raised by users, and the model management part should have the functions of storage and dynamic modeling. The database is used to store a large amount of data, which is generally organized into a form easy to operate a large amount of data; the database is managed and maintained by the database management system, including the establishment, deletion, modification, retrieval, sorting and index of the database.

2.2 Database Design

The decision support basis of logistics management major mainly includes data information of learning and online platform, questionnaire survey results, investigation records,

document information, etc. These data from different sources, in different forms into the system, must be strictly classified data, can be stored in the database. There are three ways to obtain the evaluation basis data: questionnaire survey, data collection, on-site investigation and so on [10–12]. Questionnaire survey method: students, teachers, management personnel, technical personnel and social personnel are investigated by issuing questionnaires from the Internet, and the survey results are returned to the database. The data formation process is shown in Fig. 2.

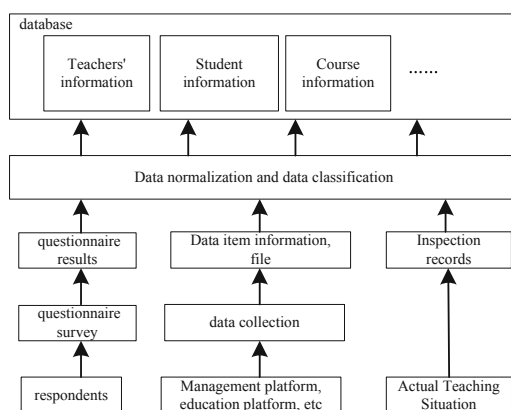


Fig. 2. Data formation process of decision basis

After obtaining the evaluation basis information through various ways, due to different data sources, data with the same meaning will have different representations. Therefore, these data need to be standardized to make the data complete, legal, consistent, suitable for statistics and analysis. The data items with the same meaning are transformed into a unified name, and the unified definition specification is used. Then, the data describing a kind of things are organized together by certain association, and distinguished by class name. For example, the data of teachers' name, age, gender and professional title are collectively referred to as teacher information; the course code, course name and credit are referred to as course information. In order to facilitate statistical analysis, query and decision-making.

After normalization and classification, the data has two parts, one is in the form of file, the other is in the form of data item. In the form of file, the storage is organized in the form of file directory; in the form of data item, the database is stored in the form of relational schema. Files are classified and stored in the hard disk by directory structure, and subdirectories are established according to different types. At the same time, index tables are established in the database to retrieve files. As shown in Fig. 1.

A file is identified by file number, file name, file type, upload time, storage path, etc. When you want to use a file, you can find the storage path of the corresponding file through the index table, and then transfer the file from the hard disk to the memory (Table 1).

Table 1. File index table

Serial number	Field name	Data type	Length	Explain
1	F_NUMBER	VARCHAR	50	Document number
2	F_TITLE	VARCHAR	100	File name
3	F_TYPE	NUMBER	10	File type
4	U_TIME	VARCHAR	20	Upload time
5	S_PATH	VARCHAR	200	Storage path

Data items are stored in the database in the form of data table. The main modes of database are hierarchical mode, network mode and relational mode. In this paper, the relational model is used for storage design. The main feature of relational schema is that not only the data is represented by two-dimensional table, but also the relationship between data is represented by two-dimensional table. One dimension of the relationship is called tuple (row), and the other dimension is called field (column). Tuple is equivalent to logical record, and each field corresponds to a specific attribute, which is equivalent to a data item in logical record. For example, part of the data storage structure based on student information, student, learning center, province, specialty, level is an entity, each entity object corresponds to a data table, there is a connection between entities, this connection makes the relevant information aggregate together, easy to query and call.

At the same time, in order to facilitate the management and query, the index table should also be established for the storage of data items, which is called user-defined data dictionary. It is used to describe the evaluation basis objects in the system, and to centralize the contact information between them for management. Data dictionary records the details of data table and data item definition in the system, including data table name, field name and field attributes (such as length, nullability, type, etc.). Through the data dictionary, we can quickly find the information about the object, which is convenient for the model to call the system data.

2.3 The Realization of Decision Support in Credit Bank System

Credit bank system includes credit identification, credit storage, credit transfer, credit exchange and credit settlement, in which credit settlement is an important part of academic certification or qualification certificate. It is set as the ultimate goal of the decision support model

$$F = \sum_{i \in N} \sum_{j \in M} s_i t_{ij} y_{ij} \tag{1}$$

The constraints of the objective function are as follows

$$\sum_{j \in M} y_{ij} = 1, i \in N \tag{2}$$

$$\sum_{j \in M} x_j = w \tag{3}$$

$$\begin{cases} y_{ij} \leq x_j, i \in N, j \in M \\ x_j \in \{0, 1\}, j \in M \\ y_{ij} \in \{0, 1\}, i \in N, j \in M \end{cases} \tag{4}$$

Where: N is the number of courses in logistics management major, M is the credit type in credit bank, s_i is the demand of the i course, t_{ij} is the credit data required from the i course to the j course, y_{ij} is whether the courses selected by users are satisfied, when satisfied, the value is 1, on the contrary, it is 0, x_j is whether the courses exist, on the contrary, it is 1, on the contrary, it is 0. Formula 1 represents the objective function, which represents the credit settlement result of online education of logistics management major; constraint formula 2 represents that only one credit of each course can meet its service; formula 3 limits the total number of courses to w ; constraint formula represents that the credit demand will not be met when the courses are lack. It can be seen from the above model that once the course is determined, the corresponding credits will be included, and then the most reasonable summary of different credits for each user will be determined. With the support of the above contents, the decision-making sequence diagram of the user in the decision-making process is shown in Fig. 3.

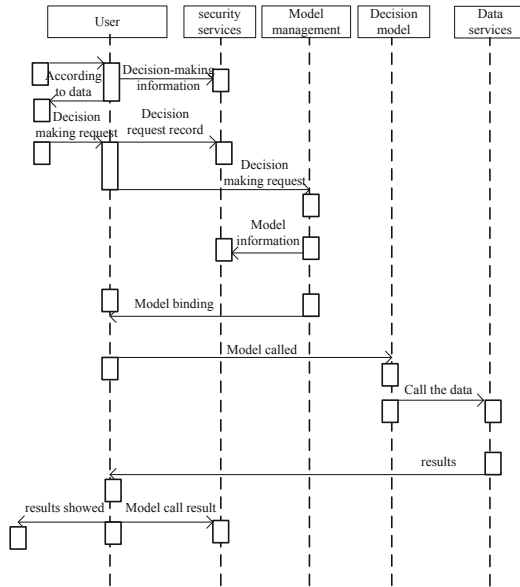


Fig. 3. Decision sequence diagram

The decision-making user first enters the user name and password through the browser to log in to the online education platform. This process requires the user to provide the login authentication check information, and the information provided will

be checked by the security service module. There are usually two kinds of login results. One is that if the user passes the authentication, the information rented by the customer will be displayed in the decision-making interface, that is, the browser layer the other is to log out of the platform if the login fails.

The information required by the decision support is input and submitted through the prompt interface of the browser, and then the submitted information will be transferred to the management unit and the resource monitoring unit responsible for security. In the model management unit, if there is a decision model needed by the user, the binding information of the decision model will be sent to the terminal browser of the decision user.

The client of decision support can call the required model by binding it. The operation of some decision models needs the supporting data required by the model. This kind of data is mainly provided by calling the data service. Based on these data, the decision model can return the results to the browser and finally display them to the decision users. Finally, the online education decision support for logistics management specialty is realized.

3 Experimental Study

3.1 Experimental Preparation

At present, in the research of online education, there is no standard data for testing. In general, the online education network platform is selected to capture the data for experimental verification. This experiment obtains the experimental data through different decision support models. The method captures the complete and structured data. The extracted data is saved in * XML format for future use. After parsing, some fields and examples of the obtained data file are shown in Table 2.

Table 2. Related data fields and examples of distance education courses

Number	Field name	Examples
1	User number	2349****6147
2	Training level	Undergraduate
3	Is it registered	Yes
4	Have you completed the course	Yes
5	Last login location	**Province
6	Gender	Female
7	Course score 0–10	Seven
8	Days of interaction with courses	5 Days
9	Number of times to watch the course video	7 Times
10	Browsing records: Institutions	University A, University B and University C
11	Major	Physical distribution management

Taking the information in the table as an example, 436 effective user information of distance education platform is collected and used as the model training set.

Using the data in the model training set, the traditional decision support model based on deep learning and OLAP are compared with the proposed model. Randomly select the similar user data of the course for comparative experiments, and analyze the actual performance of three different decision support models.

3.2 Experimental Results and Analysis of Decision Support Model Fitting

In the model evaluation experiment, the linear regression analysis evaluation method is used to verify the best approximation regression of the quantitative analysis model. The closer the fitting slope is to 1, the higher the set degree is, and the more complete the data is. The experimental results are shown in Fig. 4.

Compared with the results in the figure, from the perspective of data regression distribution, the data in figure a is distributed in the upper part with a slope greater than 1; the data in Figure B is distributed in the lower part with a loose distribution on both sides of the line with a slope less than 1; the data in Figure C is relatively concentrated with a uniform distribution along the line with a slope of 1. Therefore, the designed online education decision support model of logistics management major from the perspective of credit bank has higher fitting level and more complete data.

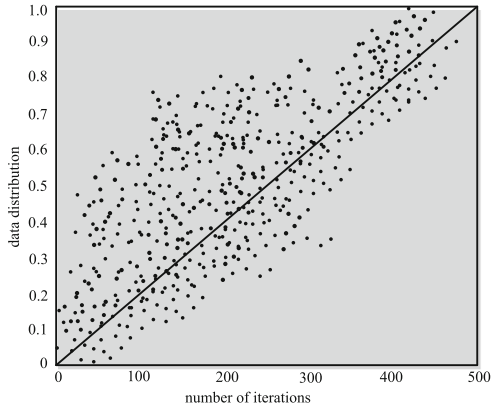
3.3 Experimental Results and Analysis of Parameter Correlation

Referring to the previous research results, a group of parameters which have the greatest impact on the model output results are selected as the target parameters. On the premise of keeping other parameters unchanged and a certain range of values, the target parameters are increased or decreased by 10% on the basis of the original value, and then the correlation index of the model output is calculated by using the calculation formula.

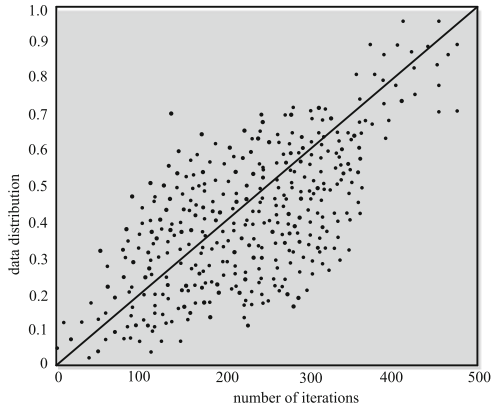
$$\chi = \frac{(A_2 - A_1)}{A_{12}} \bigg/ \frac{(B_2 - B_1)}{B_{12}} \quad (5)$$

Where: χ is the correlation index, B_1 and B_2 are the minimum and maximum values of input parameters, A_1 and A_2 are the model outputs corresponding to B_1 and B_2 , B_{12} is the average value of B_1 and B_2 , and A_{12} is the average value of A_1 and A_2 . When χ is close to 0, the correlation is very low; when χ is between 0.5 and 1.0, the correlation tends to be in the middle; when χ is greater than 1, the correlation is relatively high. Based on the above calculation methods, the results of different decision support models are shown in Table 3.

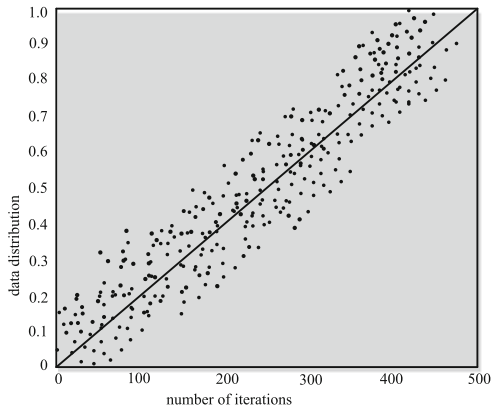
It can be seen from the results in the table that for the data of different attributes in the model, the correlation of the parameters of the proposed decision support model is relatively low. In contrast, the correlation of the parameters of the two traditional decision support models is relatively high, which indicates that the change of parameters has a greater impact on the effect of decision support in practical application. This is because this method restricts the objective function and normalizes the data, which improves the reliability of educational decision support.



(a) Deep learning based decision support model fitting experimental results



(b) OLAP Based Decision support model fitting experimental results



(c) The proposed decision support model fits the experimental results

Fig. 4. Experimental results of different decision support models

Table 3. Experimental results of parameter correlation of different decision support models

	Relational parameters	Defined parameters
Decision support model based on deep learning	1.62	0.54
Decision support model based on OLAP	1.87	0.68
A decision support model is proposed	0.23	0.19

4 Concluding Remarks

With the rapid development of society and the development of network technology, colleges and universities will face more education and teaching problems, need more and more decision-making services, and need to solve more complex decision-making problems. The traditional decision-making support model can not meet the needs of online education for decision-making support at this stage. At the same time, for different decision-making users, the demand for decision-making system is not satisfied. However, there is no decision support model for the mechanism of “credit bank”. This paper takes the influence of “credit bank” on students’ learning style as the research object. This paper designs the decision support model of logistics management online education from the perspective of “credit bank”. After the model is designed, a large number of comparative experiments verify the reliability of the designed decision support model. However, due to time constraints, there are still some problems to be solved in the design of decision support model, such as the design of personalized service. In the follow-up research, we should expand the design of decision support model, expand the application scope of decision support model, and provide better technical support for online education from the perspective of “credit bank”.

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